

Amendment and Response to Office Action  
U.S. Serial No. 10/603,572  
Inventor: Jason DEAN  
Filed: June 25, 2003  
Attorney Docket No: 979-002CIP

#### **AMENDMENT TO THE SPECIFICATION**

The Specification as filed recited in relevant part, at paragraph [00035]:

An electronic digital compass suitable for use with the present invention is described in U.S. Patent No. 4,851,775, issued on July 25, 1989 to Kim et al., and assigned to Precision Navigation, Inc. of Menlo Park, CA, the entire disclosure of which is expressly incorporated herein by reference in its entirety.

According to MPEP 608.01(p), 2163.07, and 2163.07(b), incorporation by reference practice permits an applicant to amend into a specification material from a U.S. patent properly incorporated by reference. Applicant asserts that U.S Patent No. 4,851,775 (hereinafter “the ’775 patent”) has been properly incorporated by reference in the instant application. Accordingly, Applicant respectfully wishes to amend paragraph [00035] by substituting therefore the following paragraph, in which quotations from the ’775 patent are presented, with the amended language shown with underline:

[00035] Robotic apparatus built and operated according to principles of the invention provide systems and methods for operating in an autonomous manner under the control of a programmed computer operating in communication with a digital compass configured to discern an orientation of the robotic apparatus. In one embodiment, the digital compass senses the magnetic field of the planet Earth. The digital compass can be implemented as a device built on a circuit board, which can discriminate two or three axial directions. Orientation readings provided by the compass are used during the operation of the robotic apparatus. An electronic digital compass suitable for use with the present invention is described in U.S. Patent No. 4,851,775, issued on July 25, 1989 to Kim et al., and assigned to Precision Navigation, Inc. of Menlo Park, CA, the entire disclosure of which is expressly incorporated herein by reference in its entirety. Electronic digital compasses of this type are available commercially from Precision Navigation, Inc., for example as the Vector 2X electronic digital compass. Technical application notes for the Vector 2X electronic digital compass are available online at <http://www.precisionnav.com/legacy/technical->

Amendment and Response to Office Action  
U.S. Serial No. 10/603,572  
Inventor: Jason DEAN  
Filed: June 25, 2003  
Attorney Docket No: 979-002CIP

information/pdf/vector-2x.pdf. U.S. Patent No. 4,851,775 describes in further detail how the compass module operates: “The compass determines orientation with respect to the Earth's magnetic field based on frequency differences as the direction of a sensor changes with respect to the Earth's magnetic field.” U.S. Patent No. 4,851,775 explains that “The value of L varies with the orientation of the sensor coil with respect to the Earth's magnetic field.  
Where  $H_e$  is the component of the Earth's magnetic field parallel to the length of the sensor and  $H_e$  is taken to be positive along the direction of  $H_0$ ,  $H_e$  can be very precisely determined by detecting frequency deviation. By having two sensors in orthogonal directions, such as x and y,  $\theta$ , the orientation angle of the magnetic North with respect to the fixed direction of the compass can be determined according to the formula

$$\theta = \text{Arctan} (H_e y / H_e x)$$

By having three sensor[s], the orientation angle of magnetic North can be determined at any fixed direction of the compass in three dimensions. With inclination information, we extract the two components  $H_e y$  and  $H_e x$ , which are parallel to the Earth's surface.”